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| 09/994,907 | 11/26/2001 | Sekharipuram R. Narayanan | 06618/733001 / CIT 3338 | 7370 |

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EXAMINER

CREPEAU, JONATHAN

ART UNIT

PAPER NUMBER

1746

DATE MAILED: 03/10/2003

8

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|---------------------------------|------------------|
| Office Action Summary | Application N . | Applicant(s) |
| | 09/994,907 | NARAYANAN ET AL. |
| | Examiner Jonathan S. Crepeau | Art Unit 1746 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 08 January 2003.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-19 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on 08 January 2003 is: a) approved b) disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) Interview Summary (PTO-413) Paper No(s) _____
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: _____

DETAILED ACTION

Response to Amendment

1. This Office action addresses claims 1-13 and newly added claims 14-19. Claims 1-5 and 7-13 remain rejected, and claims 14-19 are newly rejected under 35 USC §102 and §103 for the reasons of record. However, the allowability of claim 6 is withdrawn as it is newly rejected under 35 USC §102 herein. Additionally, claims 15-19 are newly rejected under 35 USC §112, first paragraph, as containing subject matter that is not supported by the originally filed application and/or not enabled by the specification. The objection to the declaration is maintained herein. Since a new ground of rejection is applied herein which was not necessitated by amendment (see section 12 below), this action is non-final.

Oath/Declaration

2. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because: Non-initialed and/or non-dated alterations have been made to the oath or declaration (in the second inventor's address). See 37 CFR 1.52(c).

Drawings

3. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on January 8, 2003 have been accepted. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities: The placement of the new paragraph concerning the wicking part 290 after page 3, line 3 (paragraph [0010]) of the specification appears to be incorrect because it interrupts a discussion of the prior art (the new paragraph is *not* concerned with the state of the prior art). Appropriate correction is suggested.

Claim Objections

5. Claims 1, 4, and 10 are objected to because of the following informalities: in claim 1, lines 6 and 7, the limitation “a plurality of electrodes associated with the electrochemical cells” appears to be extraneous since an “electrochemical anode” and an “electrochemical cathode” for each cell are previously defined in the claim. In claim 4, the last line reads “substantially the same size as said.” It appears that the phrase “electrochemical cells” should be added to the end of the claim. In claim 10, line 7, “said hot pressing” lacks antecedent basis. Furthermore, the

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clause containing this limitation (“which curing binder is heated during said hot pressing”)

appears to be redundant in view of lines 9 and 10. Appropriate correction is suggested.

6. Claim 12 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 10 was amended to incorporate the limitations of claim 12, however, claim 12 was not canceled.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 17-19 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 17 recites the phrase “between said anode and notecards.” The originally-filed application does not in any way disclose, suggest, or otherwise provide a definition for the term “notecard.” Accordingly, this limitation is considered to constitute new matter.

9. Claims 15, 16, 18, and 19 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a *current* which travels along a length or width of a cell, does not reasonably provide enablement for a *voltage* which travels along a length or width of the cell. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. It is submitted that a person skilled in the art would not know how a voltage "travels." A "voltage" is commonly understood as a potential difference between two points. As such, it is unclear how a voltage "travels." Claims 15, 16, 18, and 19 will be interpreted herein as requiring that the current, not the voltage, travels in the specified manner.

Claim Rejections - 35 USC § 102

10. Claims 1, 4, 5, 7-9, and 14-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Watkins et al (U.S. Patent 5,108,849). Regarding claims 1 and 5, the reference is directed to a fuel cell comprising a plurality of adjacent membranes (see Figure 1; col. 2, line 38). Regarding claims 1, 5, 14, and 17, a plurality of electrodes (16, 18) are in contact with the membranes. A plurality of interconnects (12, 13) are located between adjacent ones of the electrodes. Regarding claim 1, current flows in a direction across the membranes. Regarding claims 1, 4, and 5, the ratio of the area of an interconnect to the area of an electrode is at least 0.2 (the interconnects are substantially the same size as the membranes; see Fig. 1). Regarding claims 8 and 9, the interconnect comprises graphite and a thermoplastic heat curing binder (see col. 4,

lines 11-41). Regarding claims 15, 16, 18, and 19, the current inherently travels along the length and width of the cells. Regarding claim 7, the reference does not expressly teach that the interconnect is “formed of a paste.” However, this limitation is a process limitation because it recites the state of the interconnect material before the final product is formed, and therefore does not need to be accorded patentable weight. Generally, process limitations in product claims do not need to be accorded patentable weight since they do not further limit the structure of the product (MPEP §2113).

Thus, the instant claims are anticipated.

11. Claims 1-5 and 14-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Tsukui et al (U.S. Patent 4,537,840). Regarding claims 1 and 5, the reference is directed to a fuel cell comprising a plurality of substantially parallel membranes (4; see Figures 1 and 3). Regarding claims 1, 5, 14, and 17, a plurality of electrodes (2, 3) are in contact with the membranes (see Figs. 1 and 2). A plurality of interconnects (20, 25) are located between adjacent ones of the electrodes. Regarding claim 1, current flows in a direction across the membranes. Regarding claims 1, 4, and 5, the ratio of the area of an interconnect to the area of an electrode is at least 0.2 (the interconnects are substantially the same size as the membranes; see Fig. 2). Regarding claims 2 and 3, a wicking part (26) feeds methanol to the edges of the membranes (see Fig. 2). Regarding claims 15, 16, 18, and 19, the current inherently travels along the length and width of the cells.

Thus, the instant claims are anticipated.

12. Claims 1, 5, 6 and 14-19 are rejected under 35 U.S.C. 102(b) as being anticipated by DE 19624887. Regarding claims 1 and 5, the reference is directed to a fuel cell comprising a plurality of substantially adjacent parallel membranes (8; see abstract, Figure 1). Regarding claims 1, 5, 14, and 17, a plurality of electrodes (7, 11) are in contact with the membranes (see Fig. 1, abstract). A plurality of interconnects (12) are located between adjacent ones of the electrodes (see col. 8, line 58). Regarding claim 1, current flows in a direction across the membranes. Regarding claims 1, 4, 5, and 6, the ratio of the area of an interconnect (12) to the area of an electrode (7) is substantially 0.2 (see Fig. 1). Regarding claims 15, 16, 18, and 19, the current inherently travels along the length and width of the cells.

Thus, the instant claims are anticipated.

Claim Rejections - 35 USC § 103

13. Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mayer et al (U.S. Patent 5,393,619) in view of Kato (U.S. Patent 6,127,059).

Mayer et al. is directed to a fuel cell having a plurality of membranes (13) in parallel with each other (see abstract; Figure 1). A cell separator (i.e., interconnector) (21) located between the cells (see Figure 1). The method of making the fuel cell includes the steps of coating an interconnect paste on electrodes associated with the membranes (col. 4, lines 38-42), and hot

pressing the electrodes to form a membrane electrode assembly (col. 4, line 65). It is further taught in column 4, lines 63-66 that the paste contains a heat-curable resin.

Mayer et al. do not expressly teach the step of coating a catalyst layer on the membranes.

The patent of Kato is directed to PEM fuel cells. In column 4, line 57 et seq., the reference teaches that a catalyst layer is directly coated onto an electrolyte membrane.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Kato to incorporate the step of coating the membranes with catalyst into the process of Mayer et al. In the cited passage, Kato teaches that this produces a “solid polymer electrolyte having an integrally formed catalyst layer.” Accordingly, since the intimate contact of the catalyst and membrane would be beneficial to fuel cell performance, the artisan would be motivated to incorporate the step of coating the membranes with catalyst into the process of Mayer et al.

14. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mayer et al. in view of Kato as applied to claims 10 and 12 above, and further in view of Watkins et al.

Mayer et al. do not expressly teach that the paste contains graphite, as recited in claim 11.

As set forth above, the patent of Watkins is directed to graphite-containing interconnect plates for fuel cells.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Watkins et al. to incorporate graphite into the interconnect material of Mayer et al. In column 4, line 23, Watkins et al. teach that “graphite is preferred because it is chemically inert in the environment used and inexpensive.” Accordingly, the artisan would be motivated to incorporate the graphite of Watkins et al. into the interconnect material of Mayer et al.

15. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mayer et al. in view of Kato as applied to claims 10 and 12 above, and further in view of Feigenbaum et al (U.S. Patent 4,450,212).

Mayer et al. further teach that the interconnect paste may be applied by “spreading by brush, spraying, dipping, squeegee, or roller, or other low cost, mass producible methods” in column 4, line 60.

However, Mayer et al. do not expressly teach that the interconnect paste is applied using a hypodermic syringe.

The patent of Feigenbaum et al. is directed to edge seals for fuel cells. In column 8, line 54, the reference teaches that the edge seal paste is deposited in a groove by a pressure gun or syringe.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of Feigenbaum et al. indicates

that the use of a syringe is functionally equivalent deposition method to those listed by Mayer et al. Accordingly, the artisan would have sufficient skill to use the syringe of Feigenbaum et al. to deposit the interconnect material of Mayer et al. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious.

In re Fout, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06.

Response to Arguments

16. Applicant's arguments filed January 8, 2003 have been fully considered but they are not persuasive. Regarding the Watkins reference, Applicants assert that "Watkins teaches only a single membrane electrode assembly in figure 1. Therefore, this is completely different than claim 1 as amended." In response, it is asserted that Watkins teaches a plurality of cells in column 2, line 38, reproduced as follows:

Multi-cell structures comprise two or more such sandwich combinations connected together in series or in parallel to increase the overall power output of the assembly as required. In such arrangements, the cells are typically connected in series, wherein one side of a given plate is the anode plate for one cell, and the other side of the plate is the cathode plate for the adjacent cell and so on.

The passage at column 7, line 22 of Watkins is also noted:

In multi-cell arrangements the other major surface of the plate may also include a continuous traversing channel. The two flow fields on opposite sides of such a single so-called "bi-polar" plate supply the fuel gas to to the anode of one cell and the oxidant gas to the cathode of the adjacent cell.

Accordingly, Watkins teaches a plurality of electrochemical cells (adjacent membranes) as recited in claims 1 and 5. Furthermore, Applicants assert that "Watkins has no interconnects whatsoever." In response, it is asserted that the fluid flow plates (12, 13) of Watkins function as

interconnects. In the fuel cell art, a common definition of an “interconnect” is a member that connects adjacent cells. This is the function of the flow plates of Watkins. Thus, Watkins teaches “interconnects,” as the term is commonly understood in the art.

Regarding the Tsukui reference, Applicants assert that “while Tsukui does teach parallel membranes, he certainly does not teach or suggest the features of amended claims 1 and 5 in which a plurality of electrochemical cells are connected together.” In response, Tsukui teaches a plurality of series connected cells in Figure 3. See also col. 5, line 56:

FIG. 3 is a perspective view showing the structure of a fuel battery which is constructed by connecting single cells in series;

Thus, Tsukui teaches a plurality of series-connected cells as recited in claim 1. Applicants further assert that Tsukui teaches the feeding of methanol to the surface of the fuel cell and not the edges of the membranes as recited in claim 3. However, Figure 8 of Tsukui shows a configuration which meets the subject matter of claim 3. Figure 8 shows the wick member (56) adjacent a membrane (51). Fuel is supplied to the membrane surface, including the edges, by the wick. Applicant’s claim 3 does not specifically point out the direction of fuel flow from the wick to the edge. Thus, the perpendicular flow of fuel in the configuration of Tsukui reads on claim 3.

In response to applicant’s argument that the Mayer reference fails to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., that the binder is “cured”) are not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Claim 10 merely recites that

the heat-curing binder is "heated." It is submitted that the carbonizing step of Mayer reads upon this "heating" step.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (703) 305-0051. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (703) 308-4333. The phone number for the organization where this application or proceeding is assigned is (703) 305-5900. Additionally, documents may be faxed to (703) 305-5408 or (703) 305-5433.

Any inquiry of general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



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March 5, 2003